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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/714,644	11/18/2003	Akira Sakai	117787	2533

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EXAMINER

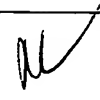
DANG, TRUNG Q

ART UNIT	PAPER NUMBER
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2823

DATE MAILED: 04/20/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

<b>Office Action Summary</b>	Application No. 10/714,644	Applicant(s) SAKAI ET AL. 	
	Examiner Trung Dang	Art Unit 2823	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

#### Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

#### Status

- 1) ☒ Responsive to communication(s) filed on 31 January 2006.
- 2a) ☒ This action is **FINAL**.                      2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

#### Disposition of Claims

- 4) ☒ Claim(s) 1-15 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-15 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

#### Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

#### Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All    b) ☐ Some \*    c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
  2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

#### Attachment(s)

- |   |   |
|---|---|
| 1) <input type="checkbox"/> Notice of References Cited (PTO-892)                        | 4) <input checked="" type="checkbox"/> Interview Summary (PTO-413)          |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)    | Paper No(s)/Mail Date. <u>04/17/06</u> .                                    |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| Paper No(s)/Mail Date _____.  | 6) <input type="checkbox"/> Other: _____.                                   |

**DETAILED ACTION**

***Claim Rejections - 35 USC § 112***

1. The following is a quotation of the first paragraph of 35 U.S.C. 112:

The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

2. Claims 1-15 are rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the written description requirement. The claim(s) contains subject matter which was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor(s), at the time the application was filed, had possession of the claimed invention.

Newly presented independent claims 1 and 8 introduce new matter in that they recite a negative limitation "without an enveloping layer". Applicants are reminded that any negative limitation or exclusionary proviso must have basis in the original disclosure, and the mere absence of a positive recitation is not basis for an exclusion (M.P.E.P §2173.05(i)).

***Claim Rejections - 35 USC § 102***

3. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

4. Claims 1-4, 8-11, and 15 are rejected under 35 U.S.C. 102(b) as being anticipated by Toru et al. (JP-A-10-256169 with machined English translation submitted by applicants on 6/16/05).

With reference to Fig. 1b, the prior art teaches the claimed invention in that it discloses a method (first embodiment) for fabricating a SiGe film, comprising the steps of:

preparing a Si substrate 12;  
forming a SiGe film 13 over said Si substrate; and  
heat treating the resulting structure to form edge dislocations 16 at a bottom region of said SiGe film adjacent to an interface of said SiGe film and said Si substrate.

Note that although the English Abstract discloses that the epitaxial layer 13 is of Ge, the reference also includes the epitaxial layer 13 is of SiGe deposited on the Si substrate (see paras. [0011] and [0050]). Furthermore, the edge dislocation 16 is a 90 degrees dislocation because the Burger vector is perpendicular to the dislocation line (see Abstract). Also note that, since the instant application does not provide definition for the term "enveloping", the term "enveloping" is broadly interpreted as to surround entirely (definition of the verb envelop according to The Random House College Dictionary, revised edition). Accordingly, the capping layer 11 formed only on the

surface of the SiGe film 13 (Fig. 1(b) **is not** an enveloping layer, and therefore the structure of Fig. 1(b) is without an enveloping layer.

For claims 2-4, the third embodiment disclosed at paragraph [0010] teaches a process comprises:

- epitaxially growing a first Ge film on a silicon substrate;
- forming a first capping layer of Si or SiGe on the first Ge film;
- performing a first heat treatment on the resulting structure;
- epitaxially growing a second Ge film on the first capping layer;
- forming a second capping layer of Si or SiGe on the second Ge film;
- performing a second heat treatment.

Note that the second Ge film can be a second SiGe as noted in paragraphs [0011] and [0050]. In this case, the first Ge reads on the claimed interfacial layer, the first SiGe capping layer reads on the claimed SiGe intermediate layer, and the second SiGe reads on the claimed SiGe film that is formed over the Si substrate. It is also noted that the heat treatment induces the edge dislocation in the semiconductor layer covered by the capping layer as described in the first embodiment, therefore the second heat treatment of the third embodiment would inherently induce the edge dislocation in the second SiGe layer, absent evident to the contrary. Moreover, the

second capping layer is not an enveloping layer for the same reason noted above, hence the third embodiment is without an enveloping layer as claimed.

For claims 8-11, the process described in the first and third embodiments would result in the structure as claimed.

For claim 15, see para. [0039] for the deposition of a silicon film on the substrate.

### ***Claim Rejections - 35 USC § 103***

5. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

6. Claims 5 and 12 are rejected under 35 U.S.C. 103(a) as being unpatentable over Toru et al. as above.

Toru teaches a process and structure as noted above, including the step of forming the interfacial layer of Ge. Toru differs from the claims in that the thickness of the Ge interfacial layer is 20nm (para. [0021]) rather than 0.1-10nm as claimed. However, the determination of thickness values for the interfacial layer within the claimed range would have been obvious to one skilled in the art because it is well settled that, absent a showing of criticality or unexpected result by applicant, where the general conditions of a claim are disclosed in the prior art, it is not inventive to discover

the optimum or workable range by routine experimentation. See *In re Aller*, 220 F.2d 454, 456, 105 USPQ 233, 235 (CCPA 1955); *In re Hoeschele*, 406 F.2d 1403, 160 USPQ 809 (CCPA 1969); *Merck & Co. Inc. v. Biocraft Laboratories Inc.*, 874 F.2d 804, 10 USPQ2d (Fed.cir), cert. denied, 493 U.S. 975 (1989); *In re Kulling*, 897 F.2d 1147, 14 USPQ2d 1056 (Fed. Cir. 1990); and *In re Geisler*, 116 F.3d 1465, 43 USPQ2d 1362 (Fed. Cir. 1997). Furthermore, the specification contains no disclosure of either the critical nature of the claimed thickness range or any unexpected results arising therefrom. Where patentability is said to be based upon particular chosen dimensions or upon another variable recited in the claim, the applicant must show that the chosen dimensions are critical. *In re Woodruff*, 919 F.2d, 1575, 1578, 16 USPQ2d, 1936 (Fed. Cir. 1990).

7. Claims 6-7 and 13-14 are rejected under 35 U.S.C. 103(a) as being unpatentable over Toru et al. as above in view of Takasaki (US 5,188,778 of record).

Toru teaches a method and a structure as noted above. Toru differs from the claims in not disclosing a GaAs as an interfacial layer formed between the Si substrate and the SiGe layer. However, Takasaki teaches that the lattice constant of GaAs and Ge (or SiGe) are close to each other, hence defects are rarely generated at the interface between the two layers (col. 2, lines 35-39 and lines 48-49). Thus, the formation of a GaAs layer between the Si substrate 12 and the SiGe layer 13 would have been obvious to one of ordinary skill in the art because one skilled in the art would

reasonably expected to achieve the same result for the reason that the lattice constant of GaAs and SiGe are close to each other.

For claims 7 and 14, the determination of the thickness of the GaAs layer as claimed would have been obvious to one skilled in the art for the same reason noted above.

### ***Response to Arguments***

8. Applicant's arguments with respect to claims 1-15 have been considered but are moot in view of the new ground(s) of rejection.

It is noted that in the Remarks filed on 1/31/06, applicants stated "As agreed during the personal interview, none of the applied references, alone or in combination, disclose or suggest a substrate and a method for fabricating a substrate that includes preparing a silicon substrate and forming a silicon germanium film over the silicon substrate without an enveloping layer, as recited in independent claim 1 and similarly recited in independent claim 8." No such issue of an enveloping layer was discussed and agreed during the interview.

### ***Conclusion***

9. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP



§ 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

10. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Trung Dang whose telephone number is 571-272-1857. The examiner can normally be reached on Mon-Friday 9:30am-6:00pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Matthew Smith can be reached on 571-272-1907. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For

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more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).



Trung Dang  
Primary Examiner  
Art Unit 2823

04/17/06